

INTERNATIONAL  
ASSOCIATION FOR TESTING MATERIALS.

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AMERICAN SECTION.

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BULLETIN No. 16.

MAY, 1900.

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PROPOSED STANDARD SPECIFICATIONS  
FOR  
STEEL CASTINGS.

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RECOMMENDED BY AMERICAN BRANCH OF COMMITTEE NO. 1, MAY 1, 1900.

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There will be a discussion of these specifications at the Third Annual Meeting of the American Section, to be held in New York, on October 25-27, 1900, and you are requested to send in your views by letter, or to be present and take part in the oral discussion.

After the Annual Meeting, Committee No. 1 will consider the points raised, and make any modifications that may be found necessary; and, if so decided at the Annual Meeting, the specifications will be sent to all members of the American Section for approval by letter ballot.

If the other countries perform their work in the same general manner, the final work of the introduction of International Specifications will be reduced to a very simple matter, as there will only be a limited number of specifications to consider instead of hundreds as at the present time.

WM. R. WEBSTER,  
*Chairman of American Branch of Committee No. 1.*

## PROCESS OF MANUFACTURE.

1. Steel for castings may be made by the open-hearth, crucible or Bessemer process. Castings to be annealed or unannealed as specified.

## CHEMICAL PROPERTIES.

2. Ordinary castings, those in which no physical requirements are specified, shall not contain over 0.40 per cent. of carbon, nor over 0.08 per cent. of phosphorus.
3. Castings which are subjected to physical test shall not contain over 0.05 per cent. of phosphorus, nor over 0.05 per cent. of sulphur.

## PHYSICAL PROPERTIES.

4. Tested castings shall be of three classes: "HARD," "MEDIUM," and "SOFT." The minimum physical qualities required in each class shall be as follows:

	Hard castings.	Medium castings.	Soft castings.
Tensile strength, pounds per square inch	85,000	70,000	60,000
Yield point, pounds per square inch....	38,250	31,500	27,000
Elongation, per cent. in two inches ....	15	18	22
Contraction of area, per cent. ....	20	25	30

5. A test to destruction may be substituted for the tensile test, in the case of small or unimportant castings, by selecting three castings from a lot. This test shall show the material to be ductile and free from injurious defects, and suitable for the purposes intended. A lot shall consist of all castings from the same melt or blow, annealed in the same furnace charge.

6. Large castings are to be suspended and hammered all over. No cracks, flaws, defects, nor weakness shall appear after such treatment.

7. A specimen one inch by one-half inch (1" x 1/2") shall bend cold around a diameter of one inch (1") without fracture on outside of bent portion, through an angle of 120° for "SOFT" castings, and of 90° for "MEDIUM" castings.



## SYNOPSIS OF SPECIFICAT

COMPILED FOR COMMITTEE NO. 1.—AMERICAN SECTION, INT

Name and Date.	Chemical Properties.					Tension Test.		
	Carbon.		Phos. Max.	Mang. Max.	Sulp. Max.	Tensile strength lbs per sq. in.	Elastic limit lbs. per sq. in.	Elonga- tion per cent.
	Min.	Max.						
Baldwin Locomotive Works, 1900.....		.35	.06	.75	.06	60,000		15
Boston & Maine R.R. Co.....			.05			{ 55,000 65,000 }	½ ult.	15
* C. B. & Q. RR., April 13, 1896.....			.06		.05	60,000		15
Buffalo, Rochester & Pgh. Ry., 1898.....			.05	.80	.05	{ 65,000 80,000 }	½ ult.	15
C., M. & St. P. Ry. Co.....						{ 55,000 70,000 }		
Chicago & Northwestern Ry., 1899.....						60,000	30,000	15
C. N. O. & T. P. Ry.....	.25	.40	.05	.80	.05	{ 65,000 75,000 }	½ ult.	15 &
Theo. Cooper, 1896.....						67,000	½ ult.	10
Dominion Government, 1899.....						{ 65,000 75,000 }	36,000	15
Grand Trunk Ry., 1897.....						67,000	34,000	20
Great Northern Ry., March 1, 1898.....	.25	.40				64,000	35,000	15
King Bridge Co., 1895.....						{ 50,000 60,000 }		
Lehigh Valley RR., July 7, 1896.....						{ 60,000 70,000 }		{ 15 20 }
M., K. & T. Ry. Co.....			.06			70,000	35,000	
Mexican Central Ry., 1898.....						60,000		18
Mo. Pacific Ry. Co.....						70,000	40,000	15
N. Y. C. & H. R. RR., 1899.....			(Acid O. H.)			{ 55,000 65,000 }		20
N. Y. C. & H. R. RR., 1899.....	.40		(Acid—O. H.)			{ 72,000 80,000 }	½ ult.	15
N. Y., Ch. & St. L. R. R. Co.....			.07			{ 65,000 70,000 }	35,000	15
N. Y., N. & H. R. R. Co.....			.07			{ 65,000 70,000 }	35,000	15
Norfolk & Western RR., Sept 5, 1893.....						{ 60,000 70,000 }		{ 15 20 }
Northern Pacific Ry., Dec. 1, 1898.....						{ 55,000 70,000 }		
Pencoyd Iron Works, 1895.....	.25	.40	.08	O. H.		70,000	35,000	
Penna RR., Jan. 1, 1897.....						67,000	36,000	20
Phoenix Bridge Co.....								
Southern Ry., 1897.....	.25	.40	.08			65,000	35,000	15
Seaman H. B.....								
** New York Rapid Transit Tunnel.....					{ Test to be made with a ¾ in. round cut from coupon. .80 .04 }	70,000	35,000	15
** New East River Bridge at New York City, Nov. 1899.....			.06		.04	60,000		20
** United States Army, Apr. 10, 1899.....			Cast steel No. 1 Cast steel No. 2	.05 .05		60,000 65,000		18 13
* United States Navy, 1899.....			Class A No. 1= Class A No. 2=	.06 .06		62,000 70,000		{ 15 20 10 15 }
** United States Treasury Dept. Revenue Cutter Service 1900.....			For moving parts..... For other parts.....			60,000 60,000		24 20
Wabash Railroad, Mar. 1, 1898.....						{ 55,000 70,000 }	35,000	13
J. A. L. Waddell, 1898.....	.25	.40	.05 (Acid O. H.)	.80	.05	{ 65,000 75,000 }	½ ult.	{ 15 in cas 17 in abl }

\* All castings to be annealed unless otherwise ordered.

\*\* All castings must be annealed.

# SPECIFICATIONS FOR CAST STEEL.

SECTION, INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

BULLETIN NO. 16.

Tension Test.			Bending Test.	Percussive Test.	Number of Tests.	Location of Tests.
Elastic Limit s. per sq. in.	Elongation, per cent.	Reduction of Area.				
.....	15 in 2 in.	.....	.....	.....	{ Two from each heat.	
ult.	15 in 8 in.					
.....	15 in 4 in.	.....	.....	.....	{ Two from each heat.	
ult.	15 in 8 in.					
0,000	15 in 8 in.					
ult.	15 & 17 in 2 in.					
ult.	10 in 2 in.					
6,000	15 in 2 in.					
4,000	20 in 2 in.					
5,000	15 in 2 in.					
.....	15					
.....	{ 15 in 2 in. 20 in 2 in. }	.....	.....	.....	{ Two from each heat.	
5,000	15					
.....	18 in 2 in.					
0 000	15 in 8 in.					
.....	20 in 2 in.					
ult.	15 in 2 in.	25%				
5,000	15 in 2 in.					
5,000	15 in 8 in.					
.....	{ 15 in 2 in. 20 in 2 in. }	.....	.....	.....	{ Two from each heat.	
5,000	20					
6,000	20 in 2 in.					
5,000	15 in 2 in.					
5,000	15 in 2 in.	20%	.....	.....	.....	{ Coupon—cast with the piece and cut off after casting is annealed.
.....	20 in 2 in.	.....	90° D = 3 T.	.....	.....	{ From coupons on the annealed casting.
.....	18 in 2 in.	30%				{ From coupons cast on the piece.
.....	13 in 2 in.	18%				
.....	{ 15 in 8 in. 20 in 2 in. 10 in 8 in. 15 in 2 in. }	20%	{ 1 in. sq. = 12° 1 in. x ½ in. = 150° 1 in. sq. = 90° 1 in. x ½ in. = 120° }	{ For large and important castings.	{ One or more from each casting of over 200 lbs.	{ From coupons on the casting or from sink-heads, when of sufficient size.
.....	24 in 2 in.	.....	1 in. x ½ in. 120° D = 4 T	Number of Tests.—One tensile and one bending test from each of the larger castings and from each heat from which smaller castings are made.		
.....	20 in 2 in.	.....	1 in. x ½ in. 90° D = 4 T			{ From coupons attached to castings or from sink heads.
5,000	13 in 8 in.	17%				
ult.	{ 15 in 2 in. fixed castings. 17 in 2 in., movable castings }					

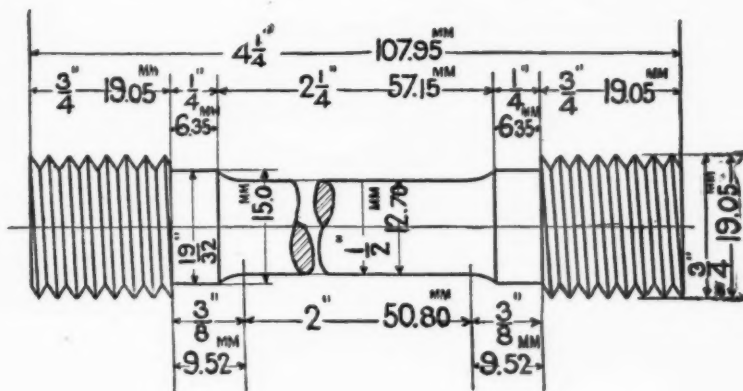
must be annealed.



## TEST PIECES AND METHODS OF TESTING.

8. The standard turned test specimen, one-half inch ( $1/2''$ ) diameter and two inch (2'') gauged length, shall be used to determine the physical properties specified in paragraph No. 4. It is shown in the following sketch:

Test Specimen  
for Tensile  
Test.



9. The number of standard test specimens shall depend upon the character and importance of the castings. A test piece shall be cut cold from a coupon to be molded and cast on some portion of one or more castings from each melt or blow or from the sink-heads (in case heads of sufficient size are used). The coupon or sink-head must receive the same treatment as the casting or castings, before the specimen is cut out, and before the coupon or sink-head is removed from the casting.

Number and  
Location  
of Tensile  
Specimens.

10. One specimen for bending test one inch by one-half inch ( $1'' \times 1/2''$ ) shall be cut cold from the coupon or sink-head of the casting or castings as specified in paragraph No. 9. The bending test may be made by pressure, or by blows.

Test Specimen  
for Bending.

11. The yield point specified in paragraph No. 4 shall be determined by the careful observation of the drop of the beam or halt in the gauge of the testing machine.

Yield  
Point.

12. Turnings from the tensile specimen, drillings from the bending specimen, or drillings from the small test ingot, if pre-



Sample  
for  
Chemical  
Analysis.

ferred by the inspector, shall be used to determine whether or not the steel is within the limits in phosphorus and sulphur specified in paragraphs Nos. 2 and 3.

#### FINISH.

13. Castings shall be true to pattern, free from blemishes, flaws or shrinkage cracks. Bearing surfaces shall be solid, and no porosity shall be allowed in positions where the resistance and value of the casting for the purpose intended, will be seriously affected thereby.

#### INSPECTION.

14. The inspector representing the purchaser, shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.